Obukhov, A. I.

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S/056/60/038/03/08/033
B006/B014

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AUTHORS: Perfilov, N. A., Darovskikh, V. F., Denisenko, G. F., Obukhov, A. I.

19

TITLE: Fission of Uranium Nuclei Induced by 9-Bev Protons

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 3, pp. 716-718

TEXT: In the article under consideration, the authors bombarded nuclear emulsions of the type P-9Ch containing naturally-occurring uranium with 9-Bev protons on the proton synchrotron of the OIYaI. When evaluating the plates the authors selected only such events in which two tracks occurred in addition to the tracks of light-charged particles (usually protons or alpha particles); tracks of fission fragments induced by thermal neutrons corresponded to the blackening intensity of these. The range ratio of light and heavy fragments was $L_l/L_h < 2$. The authors confined themselves to such cases in which a considerable fragmentation admixture was observable at $L_l/L_h > 2$. Altogether, 1,042 such stars were recorded. The fission cross section was

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Fission of Uranium Nuclei Induced by 9-Bev Protons

calculated from the formula $\sigma_f = N_f/N_{nucl}N_p$, where N_f denotes the number of fissions found per cm^3, N_{nucl} the number of uranium nuclei per cm^3, and N_p the proton flux. It was found that $\sigma_f = (1.3 \pm 0.4)$ barns. When 9-Bev protons interact with the nuclei of the emulsion secondaries with $E < 9$ Bev occur which make some contribution to the cross section. This background is considered to be ~30%, so that the true value of σ_f is likely to be $\approx$0.9 barn. The mass ratio of fragments may be calculated from the value L_l/L_h. Fig. 1 shows the distribution of the fission events, which were accompanied by the departure of charged particles, as dependent on L_l/L_h. Hence it follows that fissions with a mass ratio of the fragments of almost unity are the most probable. Fig. 2 shows the dependence of the sum of average range of the fragments on L_l/L_h. The distribution exhibits three peaks. The results obtained by studying the angular distribution of the said fragments are also given. The ratio between the particle number in two angular ranges, $N(0-30^\circ)/N(60-90^\circ)$ was 1.07 ± 0.11, i.e., the distribution was isotropic

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Fission of Uranium Nuclei Induced by 9-Bev Protons

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within the statistical limits of error. The distribution of the fission events according to the number of the accompanying "black" prongs is illustrated in Fig. 3. It was found that $\bar{n}_{\sigma p} = 3.82$, while $\bar{n}_p = 1.16$ at 660 Mev. In conclusion, the authors thank the team of the laboratoriya vysokikh energiy OIYaI (High-energy Laboratory of the Joint Institute of Nuclear Research) for their assistance in carrying out the bombardment. There are 3 figures and 5 Soviet references.

ASSOCIATION: Radiyevyy institut Akademii nauk SSSR (Radium Institute of the Academy of Sciences, USSR)

SUBMITTED: September 10, 1959

Card 3/3

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001237720012-6"

OBUKHOV, A.I.; PERFILOV, N.A.

Anisotropy in the fission of bismuth and uranium irradiated by 660 Mev. protons. Zhur. eksp. i teor. fiz. 40 no.5:1250-1252 My '61. (MIRA 14:7)

1. Radiyevyy institut AN SSSR.
(Nuclear fission) (Protons)

L 41868-65 EWT(m)/EPF(n)-2/EWP(t)/EWP(b)/EWA(h) Pu-4/Peb IJP(c) WW/JD/JG

ACCESSION NR AM5007591 BOOK EXPLOITATION S/ 23 B+1

Obukhov, A. I.

Study of nuclear fission asymmetry and anisotropy during irradiation of uranium and bismuth by high-energy protons (Izucheniye assimmetrii i anizotropii deleniya yader pri obluchenii urana i vizmuta protonami vysokikh energiy), Leningrad, 1963, 136 p. illus., biblio. (At head of title: Radiyevyy institut im. V. G. Khlopina AN SSSR). Unpublished dissertation submitted for the degree of candidate of physical and mathematical sciences.

TOPIC TAGS: nuclear fission, spontaneous fission, fission products, uranium, bismuth, proton radiation

TABLE OF CONTENTS [abridged]:

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L 41868-65
ACCESSION NR AM5007591

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Bibliography -- 127

SUBMITTED: 00

SUB CODE: NP

NR REF SOV: 052

OTHER: 128

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Card 2/2

BELYAYEV, L.M.; FRANTSUZOV, Ya.L.; OBUKHOV, A.I., nauchn. red.;
ZHURAVLEV, B.A., red.

[Erecting freight and passenger suspended cableways]
Montazh gruzovykh i passazhirskikh podvesnykh kanatnykh dorog. Moskva, Stroiizdat, 1964. 250 p.
(MIRA 17:12)

SOV/56-35-4-38/52

21(7)

AUTHOR: Obukhov, A. I.

TITLE: Determination of the Momentum and the Excitation Energy Generated by a Heavy Nucleus in Interaction With a Fast Proton (Opredeleniye impul'sa i energii vozbuzhdeniya, poluchayemykh tyazhelym yadrom pri vzaimodeystvii yego s bystrym protonom)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 4, pp 1042-1044 (USSR)

ABSTRACT: The author experimentally determined the mean value of the longitudinal as well as of the vertical component of the nuclear momentum in the interaction of 660 MeV protons with uranium nuclei. For these investigations the author employed the photo-emulsions method. The angular distribution of fission fragments in the system of the fissioning nucleus is assumed to be isotropic in first approximation. The plate was irradiated by a proton beam vertical to its surface. A table supplies the values found for the components of the nuclear momentum, as well as theoretical values, which were calculated from the data on the angular- and energy distribution of cascade nucleons.

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SOV/56-35-4-38/52

Determination of the Momentum and the Excitation Energy Generated by a Heavy Nucleus in Interaction With a Fast Proton

This table shows the qualitative agreement between calculated and experimental results. The author thanks Professor N. A. Perfilov for some critical comments, and he expresses his gratitude to N. S. Ivanova and I. I. P'yanov, who made the calculated data concerning the angular- and energy distribution of uranium cascade nucleons available. There are 1 table and 7 references, 3 of which are Soviet.

ASSOCIATION: Radiyevyy institut Akademii nauk SSSR (Radium Institute of the Academy of Sciences USSR)

SUBMITTED: June 2, 1958

Card 2/2

OBUKHOV, A. K.

Fisheries

All our strength should be given to carrying out the state plan for catching fish in 1953, Ryb. khoz. 29, No. 2, 1953.

9. **Monthly List of Russian Accessions**, Library of Congress, May 1953. Unclassified.

OBUKHOV, A.M.

Normal'naya korrelyatsiya vektorov. IAN, SER. MATEM. 1938, 339-370.
Teoriya korrelyatsii vektorov, M. uchen, zap, un-ta, 45 (1940), 73-92.
O rassayanii zvuka v turbulentnom potoke. DAN, 30 (1941), 611, 614.
O raspredelenii energii v spektre turbulentnogo potoka. DAN, 32 (1941), 22-24.

SO: Mathematics in the USSR, 1917-1947
edited by Kurosh, A. G.
Markushevich, A. I.
Rashevskiy, P. K.
Moscow-Leningrad, 1948

OBUKHOV, A.M.

6.10-180 551.551

Obukhov, A. M., O raspredelenii energii v spektre turbulentnogo potoka. [Distribution of energy in the spectrum of turbulent current.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr. i Geofiz.*, No. 4/5:453-466, 1941. fig., 9 refs., 42 eqs. German summary p. 463-466. DLC—The detailed mathematical development of the spectral theory of turbulence, based on RICHARDSON's theory (1922), shows that in the velocity field of a homogeneous turbulent current there are eddies of different scales. The dimensions of large disturbances are limited by the scale of the current itself; the size of the smallest which are determined by the viscosity of the medium, and small disturbances exist at the expense of the energy of the larger. The author introduces the idea of the spectrum of the current and of the distribution of energy in the spectrum. The function of energy distribution is determined by considerations of the balance of energy and the stability of the turbulent field. The results explain theoretically the dependence of the coefficient of exchange on the scale of observation as indicated by RICHARDSON. *Subject Headings:* 1. Atmospheric turbulence 2. Turbulence theory 3. Richardson's criterion.—*I. M. P.*

GP

OBUKHOV, A. M.

"Toward the Theory of Atmospheric Turbulence," Izvestiya AN USSR, Physics Series, No 1-2, 1942, pages 59-64.

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551.551.5 2563

On Atmospheric Turbulence. A. M. Obukhov. (*J. Phys., U.S.S.R.*, 1942, Vol. 6, No. 5, pp. 255-256.)

Abstract of a paper of the Acad. Sci., U.S.S.R.

Acoustics & Audio
Dynamics

2013. ON PROPAGATION OF SOUND WAVES IN EDDYING FLOW.—A. M. Obukhov. (Comptes Rendus (Doklady) de l'Ac. des Sci. de l'URSS, 20th April 1943, Vol. 39, No. 2, pp. 46–48: in English.)

"In a paper by Andreev & Russakov (in 1034 ref. "1") certain problems of wave acoustics of a medium in motion are solved on the basis of equations obtained for the case of a potential field of velocities. However, in the most interesting cases from a practical point of view, such as the propagation of sound in a turbulent atmosphere, one has to deal with an eddying flow which, strictly speaking, does not come under the scope of the equation derived in the above-mentioned paper. In the present note approximate equations are derived for the acoustics of an eddying flow. It is seen from eqn. 11 that for a flow with a variable vorticity a correction term of, generally speaking, first order of smallness, depending upon the derivatives of the flow rot $\vec{v}$, has to be introduced in Andreev's equation. This term can only be neglected when the dimensionless vorticity is much less than the dimensionless velocity of flow $\vec{u}$, that is, when the non-uniformity of the velocity field of the main flow is much greater than the length of the acoustic wave. This is the case on transition from wave acoustics to geometrical acoustics."

OBUKHOV, A. M.

Meteorological Abst. 4B-140 551.551
Vol. 4 No. 2
Feb. 1953
Bibliography on
Turbulent Exchange

Obukhov, A. M., Turbulentnost' v temperaturno neodnorodnoi atmosfere. [Turbulence in an atmosphere with inhomogeneous temperature.] Akademiia Nauk, SSSR, Institut Teoreticheskoi Geofiziki, Trudy, 1:95-115, 1946. 3 figs., 3 tables, 6 ref., 38 eqs. Also: Akademiia Nauk, SSSR, Izvestiia, Ser. Geogr. i Geofiz., 13(1):58-69, 1949. DLC—Influence of vertical temperature inhomogeneity on evolution of turbulence in the atmosphere. This influence is quantitatively calculated by applying correction factors to Prandtl's semi-empirical theory; the universal Richardson's criteria being used. As a result it is possible to quantitatively evaluate the height of the dynamic turbulent layer under various conditions. (Same item as 1-98, Jan. 1950. MAB.)
Subject Headings: 1. Turbulence theory 2. Atmospheric turbulence.—M.R.

OBUKHOV, A. M. Dr. Physicomath.Sci.

Dissertation:"Application of Methods for Statistic Description of Continuous Fields to the Theory of Atmospheric Turbulence." Inst. of Theoretical Geophysics, Acad. Sciences, USSR. 11 June, 1947.

SO: Vechernyaya Moskva, Jun., 1947 (Project #17836)

OBYKHOV, A.M.

USSR/Physics
Stratosphere
Meteorology

Jul/Aug 49

"Problem of the Geostrophic Wind," A. M. Obykhov, Geophys Inst, Acad Sci USSR, 26 pp

"Iz Ak Nauk SSSR, Ser Geog i Geofiz" Vol XIII, No 4

60/49T109

Study of the equations of motion in fluid in a field of deviating force makes possible a rational explanation of the nature of the relation between the wind and pressure fields. Wind deviation from the geostrophic value is shown to form waves propagated with great velocity in the atmosphere, due

60/49T109

USSR/Physics (Contd)

Jul/Aug 49

to which, in a short time, the pressure field is "adapted," i.e., proceeds in accordance with the field of velocities. Problem of a change in the "adapted" hydrodynamic field is examined. Submitted by Acad A. N. Kolmogorov 7 Dec 48.

60/49T109

OBUKHOV, A. M.

Obuhov, A. M. The structure of the temperature field in a turbulent flow. Izvestiya Akad. Nauk SSSR. Ser. Geograf. Geofiz. 13, 58–69 (1949). (Russian)

Kolmogoroff [C. R. (Doklady) Acad. Sci. URSS (N.S.) 30, 301–305 (1941); these Rev. 2, 327] defined the notion of locally isotropic turbulence and introduced the structure function of the field of velocities of a turbulent flow. In the paper under review the author introduces the structure function of the temperature field of a turbulent flow, defined as the mean value of the square of the difference of the temperature at two points M and M': $H(M, M') = \overline{[T(M') - T(M)]^2}$. In the case of local isotropy and very large Reynolds numbers the function $H(M, M')$ depends only on the distance r between the points M and M', it being understood that both points belong to some domain and the distance r is small in comparison with the scale of the turbulence. Using a method similar to that applied by Kolmogoroff [loc. cit.] in the case of the locally isotropic field of velocities of a turbulent flow the author is led to some similar results concerning the structure function of the temperature field. For instance, if the points M and M' are "not very close together" it is found that $H(r)$ is of the form (1) $H(r) = k^2\bar{N}\bar{\varepsilon}^{-1/3}r^{2/3}$ where $\bar{N}$ is the mean velocity of homogenization of the temperature field, $\bar{\varepsilon}$ is the mean dissipation of energy per unit of mass, and k is a numerical constant. The dependence upon $r^{2/3}$ is the same result as that obtained by Kolmogoroff [loc. cit.] and Obuhov [Bull. Acad. Sci. URSS. Sér. Géograph. Géophys. [Izvestiya Akad. Nauk SSSR] 1941, 453–466; these Rev. 4, 121] for the field of velocities. For "small" values of r the approximate formula (2) $H(r) = \frac{1}{3}\bar{N}\lambda^{-1}r^2$ holds, where λ is the thermometric conductivity.

A scale r_1 is assigned to the characteristic of the field of pulsations of the temperature field. It is defined geometrically as the value of the abscissa of the point of intersection of the two asymptotic representations (1) and (2) of $H(r)$ for "large" and "small" values of r, respectively; $r_1 = (27k^6\lambda^3/\bar{\varepsilon})^{1/4}$. Since Prandtl's number $P_r = \nu/\lambda$ is of the order of unity for the atmosphere, r_1 is of the same order of magnitude as the inner scale of turbulence (size of smallest eddies), $\eta \sim (\nu^3/\bar{\varepsilon})^{1/4}$, introduced by Kolmogoroff [loc. cit.].

Source: Mathematical Reviews, 1950 Vol No. 7

OBUKHOV, A.M.

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Obuhov, A. M. The pulsation of pressure in a turbulent flow. Doklady Akad. Nauk SSSR (N.S.) 66, 17-20 (1949). (Russian)

In this paper the author presents a sufficiently general method for the determination of the structure function of the pressure field in an isotropic turbulent flow of incompressible fluid. Under the assumption of statistical homogeneity and isotropy of the field of velocities and the pressure field, and under the further assumption that the fourth moments of the derivatives of the field of velocities have approximately the same relation to the second moments as in normal distributions [cf. Millionščikov, Bull. Acad. Sci. URSS. Sér. Géograph. Géophys. [Izvestia Akad. Nauk SSSR] 1941, 433-446; these Rev. 4, 121], the equation

$$\Delta^2\Pi(\rho) = -\sigma^2 \frac{\partial^4 D^{\alpha\beta}}{\partial\xi^\alpha\partial\xi^\gamma} \frac{\partial^2 D^{\gamma\delta}}{\partial\xi^\beta\partial\xi^\delta}$$

connecting the structure function of the pressure field $\Pi(\rho) = (p(M_2) - p(M_1))^2$ and the structure function of the field of velocities $D^{\alpha\beta}(\xi) = (v^\alpha(M_2) - v^\alpha(M_1))(v^\beta(M_2) - v^\beta(M_1))$ [illegible]. The structure tensor for the locally isotropic field [illegible] (cf. Kolmogoroff, C. R. (Doklady) Acad. Sci. URSS (N.S.) 30, 301-305 (1941); these Rev. 2, 327] has the form

$$D^{\alpha\beta}(\xi) = D_{nn}(\rho)\delta^{\alpha\beta} + \left(\frac{D_{nn} - D_{tt}}{\rho^2}\right)\xi^\alpha\xi^\beta,$$

where D_{nn} and D_{tt} are the longitudinal and the transversal structure functions of the field of velocities, ρ is the distance between the points M_1 and M_2, and σ is the density of the medium. A particular case, $D_{tt} = b^2\rho^{\frac{2}{3}}$, $D_{nn} = \frac{3}{4}b^2\rho^{\frac{2}{3}}$ (b a constant) is considered. This leads to the relation $\Pi(\rho) \approx \sigma^2 D_{tt}^2(\rho)$ [cf. Kolmogoroff, loc. cit.; C. R. (Doklady) Acad. Sci. URSS (N.S.) 32, 16-18 (1941); these Rev. 3, 221; Obuhov, C. R. (Doklady) Acad. Sci. URSS (N.S.) 32, 19-21 (1941); Bull. Acad. Sci. URSS Sér. Géograph. Géophys. [Izvestia Akad. Nauk SSSR] 1941, 453-466; these Rev. 3, 221; 4, 121]. The author points out that the pulsation of pressure in a turbulent flow apparently is connected with the problem of interaction between the field of sound and the turbulence, however from the acoustical point of view of a turbulent flow not only the spatial structure, but also the time spectrum of the pulsation of pressure may be of interest.

L. Lemanis (Vancouver, B. C.)

Source: Mathematical Reviews, Vol. 10, No. 10

OBUKHOV, A. M.

PA 3/50T89

USSR/Physics - Atmosphere
Flow, Turbulent

1 Aug 49

"Local Structure of Atmospheric Turbulence," A. M. Obukhov, Geophys Inst, Acad Sci USSR, 4 pp

"Dok Ak Nauk SSSR" Vol LXVII, No 4 pp-643-7

Previously, A. N. Kolmogorov had calculated longitudinal and transverse "structural functions" of turbulent flow as a function of the distance between observation points r when this distance was sufficiently small. Attempts to calculate functions of any range of values of r lying within the region for which the hypothesis on the local isotropicity of flow holds true. Used a

3/50T89

USSR/Physics - Atmosphere (Contd) 1 Aug 49

differential thermoanemometer with a Godecke amplifier to measure the absolute value of difference of speeds in a direction perpendicular to the base (transverse "structural function") 1.15 meters above a meadow. Varied distance between receivers r from 0.1 to 80 cm. Submitted by Acad A. N. Kolmogorov 2 Jun 49.

3/50T89

OBUKHOV, A.M.

Turbulentnost'. (In: Mekhanika v SSSR za tridtsat' let, 1917-1947. Moskva, Gostekhizdat, 1950. p. 332-340)

Bibliography: p. 339-340. 28 references.

Title tr.: Turbulence.

SO. Aeronautical Science and Aviation in the Soviet Union. Library of Congress. 1955.

KHOV, A. M.

USSR/Geophysics - Microclimate May/Jun 51

"Characteristics of the Microstructure of the Wind in the Layer of the Atmosphere Close to the Earth," A. M. Obukhov, Geophys Inst, Acad Sci USSR

"Iz Ak Nauk SSSR, Ser Geofiz" No 3, pp 49-68

Describes procedure for measuring pulsations in wind velocity; and presents results of investigations into microstructure of wind in the atm layer close to the Earth (up to 15 m). Compared results of immediate measurements of characteristics of atm turbulence with conclusions from the theory

186T43

USSR/Geophysics - Microclimate (Contd) May/Jun 51

of local isotopic turbulence. Describes expts on measurement of vertical component of wind velocity and on detg Reynolds stresses. Submitted 16 Jan 51 by Acad A. N. Kolmogorov.

Translation U-2088, 23 June 52

186T43

OBUKHOV, A.M.

Obuhov, A. M., and Yaglom, A. M. The microstructure of a turbulent flow. Akad. Nauk SSSR. Prikl. Mat. Meh. 15, 3–26 (1951). (Russian)

This is a joint exposition of work on locally isotropic turbulence by the authors which has been published in the last few years in separate notes. Let M and M' be two points at a distance r in a turbulent fluid, $v_l(M)$ and $w_l(M)$ the components of the velocity and acceleration, respectively, in the direction MM', $p(M)$ the pressure, and

$$D_{ll}(r)=\overline{[v_l(M')-v_l(M)]^2},\quad \Pi(r)=\overline{[p(M')-p(M)]^2},$$

$$A_{ll}(r)=\overline{w_l(M)w_l(M')}.$$

In the first part of this paper the known fundamental equations of locally isotropic turbulence are derived and then the behavior of $D_{ll}(r)$ computed under the assumption that the skewness $S=D_{lll}(r)/[D_{ll}(r)]^{3/2}$ is a constant ($=-0.4$) for the whole range of r [cf. Obuhov, Doklady Akad. Nauk SSSR 67, 643–646 (1949); these Rev. 11, 66]. [Reviewer's note: The most recent measurements of S by R. W. Stewart [Proc. Cambridge Philos. Soc. 47, 146–157 (1951), especially pp. 156, 157] indicate that S is not constant in either r or the Reynolds number.]

In part two the behavior of $\Pi(r)$ is computed making use of the above assumption on S and an additional assumption that the fourth moments of the velocity field behave as in a Gaussian distribution [cf. Obuhov, ibid. 66, 17–20 (1949); these Rev. 10, 757]. In the last part the accelerations and the pressure gradients are considered [cf. Yaglom, ibid. 67, 795–798 (1949); these Rev. 11, 280] and A_{ll} is computed assuming S constant. In the first and last parts the corresponding quantities for the components normal to MM' are also considered (so that the corresponding tensors may be constructed). The computed results are presented graphically in suitable nondimensional form. The asymptotic values for $r\to 0$ and $r\to\infty$ are also considered in each case. [See also the following review.]

J. V. Wehausen.

Source: Mathematical Reviews, Vol 12 No. 10

OBUKHOV, A.M.; PINUS, N.Z.; KRECHMER, S.N.

Results of experimental investigations of microturbulence in the free atmosphere. Trudy TSAO no.6:174-183 '52. (MIRA 11:6)
(Atmospheric turbulence) (Aeronautics in meteorology)

OBUKHOV, A.M.

USSR.

Obuhov, A. M. On the influence of weak inhomogeneities of the atmosphere upon the propagation of sound and light. Izvestiya Akad. Nauk SSSR. Ser. Geofiz. 1953, 155–165 (1953). (Russian)

L'auteur traite l'équation des ondes (1) $c^{-2}\partial^2\varphi/\partial t^2-\Delta\varphi=0$ où la vitesse de propagation: $c=c_0/n$, n l'indice de refraction voisin de l'unité $n=1+\mu$, $\mu\ll1$ fonction des coordonnées du point. Considérons une symétrie sphérique et soit φ une onde monochromatique de fréquence ω

$$\varphi=A(r)\exp\{i[\omega t-S(r)]\}.$$

En substituant cette valeur de φ dans l'équation (1) et en négligeant les termes en μ^2, on trouve, en introduisant quelques hypothèses restrictives, les valeurs de $\log A(r)$ et de la phase $S(r)$. L'auteur reprend ensuite le problème du point de vue statistique en introduisant un coefficient de corrélation de la forme $B(M, M_1)=\mu(M)\mu(M_1)$, où M et M_1 sont deux points voisins, ce qui permet d'expliciter davantage les expressions $\log A(r)$ et $S(r)$. On applique les résultats obtenus aux problèmes: (a) la scintillation des étoiles et (b) les pulsations de l'amplitude du son qui se propage dans une atmosphère légèrement hétérogène.

M. Kiveliovitch (Paris).

OBUKHOV, A. M.

Monin, A. S. and Obukhov, A. M., Bezrazmernye kharakteristiki turbulentnosti v prizemnom sloe atmosfery. [[illegible] characteristics of turbulence in the atmospheric layer near the ground.] *Akademiia Nauk SSSR, Doklady*, 93(2):257-260, Nov. 11, 1953. 2 figs., 6 refs., 12 eqs. DLC—The inhomogeneity of air temperature influences considerably the characteristics of turbulent exchange. In this highly theoretical paper the authors apply methods of the theory of similarity to an analysis of empirical data on the distribution of temperature and winds in the atmospheric layer near the ground. They disregard the action of Coriolis force, the influence of molecular viscosity and heat conductivity and take into consideration the small changes of density, caused only by changes of temperature, but not pressure. *Subject Headings*. 1. Turbulent exchange 2. Temperature change effects.—*A.M.P.*

BC

OBUKHOV, A. M.

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1-F\W

Obuhov, A. M. Probabilistic description of continuous fields. Ukrain. Mat. Ž. 6 (1954), 37-42. (Russian)

Math

It is well-known that an isotropic tensor $\overline{u_i u_j'}$ (where u_i and u_j' are the values of the field quantities at two points, P and P', say) solenoidal in its indices can be derived in terms of a single scalar Q in the manner

$$\overline{u_i u_j'} = \text{curl } Q(r)\varepsilon_{ijk}\xi_k,$$

where ξ is the vector joining PP'; thus

$$(1) \qquad \overline{u_i u_j'} = \frac{Q'}{r}\xi_i\xi_j - (rQ' + 2Q)\delta_{ij},$$

where primes attached to scalars such as Q denote differentiations with respect to $r = |\xi|$. Similarly, the tensor $\overline{v_i v_j'}$ where $v = \text{grad } \phi$ is an irrotational vector can be derived in terms of the scalar $S(r) = \overline{\phi\phi'}$ thus:

$$(2) \qquad \overline{v_i v_j'} = -\frac{\partial^2 S}{\partial\xi_i\partial\xi_j} = \left(\frac{S'}{r} - \frac{S''}{r}\right)\xi_i\xi_j - \frac{S'}{r}\delta_{ij}.$$

If we denote by F_s and G_s and F_n and G_n the corresponding transverse and longitudinal correlations, then

$$(3) \quad F_s = -(rQ' + 2Q), \; G_s = -2Q; \; F_n = -S'/r, \; G_n = -S''.$$

1/1

2

From these relations it follows:

(4) $rG_s' = 2(F_s - G_s)$ and $rF_n' = -(F_n - G_n)$.

Now an arbitrary vector field can be expressed as the superposition of a solenoidal (u) and an irrotational (v) vector field. Also the cross correlation $\overline{u_i v_j}'$ is seen to be zero since this is the derivative with respect to r of the solenoidal isotropic vector $\overline{u_i \varphi}'$; and it is known that the latter is zero. Thus if $w = u + v$ then $\overline{w_i w_j}' = \overline{u_i u_j}' + \overline{v_i v_j}'$. Thus the two point correlation in an arbitrary vector field can be expressed in terms of two scalars Q and S and is the sum of equations (1) and (2). If $F = (F_s + G_s)$ and $G = (G_s + G_n)$ are the transverse and the longitudinal correlations of this general field then the parts referring to the solenoidal and the irrotational fields can be deduced from the identities:

$$r(G_s' - 2F_n') = 2(F - G),$$

$$r(G_s' + F_n') + 3(G_s + F_n) = 2F + G.$$

2

Thus

$$G_s-2F_n=-2\int_r^\infty (F-G)\frac{d\rho}{\rho},$$

$$G_s+F_n=\int_0^r \rho^2(2F+G)d\rho.$$

Some general comments on Kolmogoroff's similarity principles are also made. *S. Chandrasekhar.*

3/3

Smw
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OBUKHOV A. M.

USSR

Obuhov, A. M. The statistical description of continuous fields. Trudy Geofiz. Inst. no. 24(151), 3-42 (1954). (Russian) 1 - F/W

This paper contains a systematic exposition of the fundamental questions of the theory of the statistical description of continuous fields, which is a basic tool in theoretical investigations of turbulence. The theory may find wider application with the use of statistical methods of investigations in geophysics. *Author's summary*

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[illegible]

~~MONIN, A.S.~~

OBUKHOV, A.M.

5

2

1.6-8 551.511:551.551

Monin, A. S. and Obukhov, A. M., Osnovnye zakonomernosti turbulentnogo peremeshivaniia v prizemnom sloe atmosfery. [Basic laws of turbulent mixing in the atmosphere near the ground.] *Akademiia Nauk SSSR. Geofizicheskii Institut, Trudy,* No. 24(151):163–187, 1954. 4 figs., tables, 20 refs., 68 eqs. DLC—The processes of mixing in a turbulent atmosphere are analyzed and more exact values of the numerical parameters are calculated on the basis of an extensive amount of empirical gradient observations collected by expeditions of the Central Geophysical Observatory and Geophysical Institute of Academy of Sciences of the U.S.S.R. The empirical data on the distribution of wind velocities at different temperature lapse rates are presented and a method of calculating the "Austausch" characteristics on the basis of measurements of wind velocity and temperature gradient is developed. *Subject Heading:* 1. Turbulent mixing.—*I.L.D.*

OBUKHOV, A.M.

FD-2576

USSR/Geophysics - Meteorology

Card 1/1 Pub. 44 6/19

Author : Obukhov, A. M.

Title : Problem of evaluating the success of alternative forecasts

Periodical : Izv. AN SSSR, Ser. geofiz, No. 4, Jul-Aug 55, 339-349

Abstract : The author gives a general analysis of the problem of searching for the most rational methods for evaluating the success of alternative forecasts and presents certain expeditious criteria governing the success of forecasting. Five references, e.g. N. A. Bagrov, "Problem of evaluating hydrometeorological forecasts," Meteorologiya i gidrologiya, No 6, 1953.

Institution : Geophysics Institute, Academy of Sciences USSR

Submitted : September 9, 1954

Obukhov, A. M.

7.5-179 551.552:551.542.1

Obukhov, A. M., A nagykiterjedésű légköri mozgások dinamikájának néhány kérdése. [A ~~few problems in~~ the dynamics of large-scale atmospheric motion.] *Időjárás*, Budapest, 59(1):1-6, Jan./Feb. 1955. 6 refs., 17 eqs. Russian and French summaries p. 6. Transl. by Mrs. L. Faragó. DLC. Also: complete German version: Einige Fragen der Dynamik von ausgedehnten atmosphärischen Bewegungen. *Acta Agronomica*, Budapest, 5(1/2):155-162. 1955. Russian and English summaries p. 162. DA—Two closely connected problems of theoretical meteorology are being dealt with in this paper: 1) why is the wind under natural conditions approximating the geostrophic wind? and 2) what processes are being excluded from the sphere of observation by applying equation systems simplified on the basis of quasi-geostrophic approximation? By an analysis of the equation system of the two-dimensional barotropic model it is shown that atmospheric pressure and wind-field anomaly can coexist but for a short period of time. By the quasi-geostrophic approximation applied to the study of natural atmospheric processes, only the fast-moving waves are excluded from the sphere of observation, the baric field adapting itself to the velocity field. In this paper the procedure is illustrated by an example. *Subject Headings:* 1. Geostrophic wind field. L. Faragó, Lászlóné (*Trans.*).—*Author's abstract.*

USSR/Geophysics - Meteorology meeting OBUKHOV, A. M. FD-1711

Card 1/1 : Pub. 45-11/12

Author : Obukhov, A. M.

Title : Chronicles. Conference of meteorologists in Budapest

Periodical : Izv. AN SSSR, Ser. geofiz., 86, Jan-Feb 1955

Abstract : From 4 to 10 October 1954, in Budapest, a conference of meteorologist was held on the initiative of the Academy of Sciences of Hungarian People's Republic, in participation with meteorologist from China, USSR, Germany, Czechoslovakia, Poland, Rumania, and Bulgaria. The principal theme of the conference was long-range weather forecasting. Brief communications were given on other problems of meteorology. Attending as representatives of the USSR were A. M. Obukhov, Corresponding Member of Academy of Sciences USSR, and N. A. Aristov, Candidate of Geographical Sciences, who reported on methods of long-range forecasting in use in the meteorological service of the USSR. Another very interesting report was on the influence of the Tibetan plateau on the circulation of the atmosphere in the northeastern part of China, by Prof. K'u Ch'eng-ch'ao. The German delegate, Prof. Phillips, indicated the importance of physicomathematical methods in forecasting. Prof. Kaptsevich (Poland) reported on anemographs.

OBUKHOV, A. M. and KRASILNIKOV, V. A.

Physics Research Institute, Lomonosov State University, Moscow.

"On Wave Propagation in Media with Irregular Fluctuations of the Refractive Index" paper presented at 2nd International Congress on Acoustics, Cambridge, Mass., 17-23 June 1956.

So: B-100200

OBUKHOV, A.M.

Propagation of Waves in a Medium with Random Inhomogeneities of the Index of Refraction. V. A. Krasil'nikov and A. M. Obukhov. *Soviet Physics-Acoustics*, No. 2, 1956, pp. 103–110. 23 refs. Translation. Review of phenomena which arise during the propagation of waves in a medium with weak random inhomogeneities caused by turbulence.

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OBUKHOV, A.M.

Krasil'nikov, V. A.; and Obuhov, A. M. On propagation of waves in a medium with random inhomogeneities in the coefficient of refraction. Akust. Ž. 2 (1956), 107-112. (Russian)

This paper is a very concise survey of methods of approximate solution of the wave equation $\phi_{tt}=c^2\nabla^2\phi$ when the velocity c can be written in the form $c=c_0(1+\mu)$, μ being a small parameter depending upon position but not upon time. Such a condition is often encountered when turbulence is present in atmospheric acoustics and optics, underwater acoustics, and radio wave propagation in the troposphere. The methods of perturbation, ray theory in both real and complex form, correlation functions, structure functions, and combinations of these are touched upon with a brief indication of the domain of applicability of each. Nearly all the references are to works of the authors. R. N. Goss (San Diego, Calif.).

Moscow State ...

OBUKHOV, A. M., YAGLOM, A. M.

"On Microstructure of Atmospheric Turbulence," paper submitted at International Assoc, of Meteorology Meetings, Toronto, Canada, 3-14 Sep 57

C-3,800,327

OBUKHOV, A.M.

OBUKHOV A.M.

KONDRATYEV, K.Ya.

3(7) PHASE I BOOK EXPLOITATION SOV/1685

Akademiya nauk SSSR. Komitet po geodezii i geofizike.

Tezisy dokladov na XI General'noy assambleye Mezhdunarodnogo geodezicheskogo i geofizicheskogo soyuza. Mezhdunarodnaya assotsiatsiya meterologii (Abstracts of Reports at the 11th General Assembly of the International Union of Geodesy and Geophysics. The International Association of Meteorology) Moscow, 1957. 38 p. /Parallel texts in Russian and English or French/ 1,500 copies printed. No additional contributors mentioned.

PURPOSE: This booklet is intended for meteorologists.

COVERAGE: These reports cover various subjects in the field of meteorology. Among the specific subdivisions discussed are: the heat balance of the Earth's surface, jet streams, transference of heat radiation, electric coagulation of cloud particles, turbulent diffusion, cloud studies, and others. Abstracts of all the articles are translated into either French or English. There are no references given.

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Bugayev, V.A. Formation of a Jet Stream in the Atmosphere Under the Influence of Mountains 9

Kogan, S.Ya., M.S. Malkevich, and Ye.M. Feygel'son. Approximate Methods of Evaluating the Light Intensity for the Case of Nonspherical Scattering in the Earth's Atmosphere and the Results of Calculations 14

Kondrat'yev, K.Ya. Transference of Heat Radiation in the Atmosphere and Associated Problems 17

Levin, L.M. The Electrical Coagulation of Cloud Particles 21

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Obukhov, A.M., and A.M. Yaglom. The Microstructure of Atmospheric Turbulence 28

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OBUKHOV, A. M., and MONIN, A. S.,

"On Meteorological Questions, Especially Diffusion and Convection,"

paper presented at the XIth General Assembly of the Int'l. Union of Geodesy and Geophysics, Toronto, Canada, 3-14 Sept. 1957 (Izv. Ak Nauk SSSR - Ser. Geog. 1958, No. 2, pp 3-8 [USSR]).

Obukhov, A.M.

25-7-9/51

AUTHOR: Obukhov, A.M., Member-Correspondent AN SSSR, Director of the Institute of Atmospheric Physics

TITLE: The National Boundaries are no Obstacle for Scientific Relations (Dlya nauchnykh svyazey granitsy ne pomekha)

PERIODICAL: Nauka i Zhizn', 1957, # 7, p 5 (USSR)

ABSTRACT: The author of this letter says that the International Youth Festival coincides with the International Geophysical Year. The scientific research work performed simultaneously all over the globe will closely unite the scientists of the world, so that one could almost speak of a "Festival of Scientists". These facts show clearly that there are no serious disagreements among people of different nationalities which cannot be overcome. Frontiers and oceans are no obstacles for friendly relations. The article contains one photo.

AVAILABLE: Library of Congress

Card 1/1

AUTHOR: Obukhov, A.M. 49-9-4/13

TITLE: On the accuracy of preliminary calculations of advective field changes in numerical weather forecasting. (O tochnosti predvychisleniya advektivnykh izmeneniy poley pri chislennom prognoze pogody).

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, 1957, No.9, pp.1133-1141 (USSR)

ABSTRACT: Analysis of the possible sources of errors in calculating the baric field is a very complicated problem and the sources of errors can be arbitrarily divided into the following groups: errors due to utilising simplified "weather forecasting equations"; errors relating to the initial conditions affecting the accuracy of forecasting of the field by the particular calculation method; computing errors due to the substitution of differential equations by difference equations and also other computing errors. The author limits himself to investigating the nature of some of the errors caused by the substitution of the coordinate derivatives by appropriate finite differences on the example of a simple model in which the field changes have an advective character. For the difference equation a solution is derived in a general form and for a concrete

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49-9-4/13

On the accuracy of preliminary calculations of advective field changes in numerical weather forecasting.

example of a "shifting front", the magnitude and the character of the respective errors are evaluated. The problem is also considered of the advisability of applying field smoothing in the calculations. In para.1 the author deals with the selection of a model, focussing attention on elucidating the possibility of solving by electronic computers, using data for a fixed network in space of the simple forecasting problem which synoptics solve without difficulty by graphical methods. In para.2 an approximate description is given of the advection by means of the appropriate differential-difference equation, whilst in para.3 the calculation of advection using smoothing is carried out. It is concluded that solving of the elementary computing operation of the field transfer by computers involves certain difficulties but the arising errors can be reduced by improved computing schemes. The author limits himself to considering the unidimensional problem but it can be assumed that the fundamental qualitative conclusions will be valid also for a spatial lattice.

Card 2/3 There are 2 figures and 11 references, 8 of which are Slavic.

OBUKHOV, A.M.

In the high-altitude laboratory. Nauka i zhizn' [24] no.11:30-31 [N] '57. (MIRA 10:11)

1. Chlen-korrespondent AN SSSR, direktor Instituta fiziki atmosfery. (Artificial satellites)

OBUKHOV, A. M.

49-11-9/12

AUTHOR: Obukhov, A. M.

TITLE: Soviet work in the field of studying atmospheric turbulence. (Sovetskiye Raboty v oblasti izucheniya atmosfernoy turbulentnosti).

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, 1957, No.11, pp. 1389-1392 (USSR)

ABSTRACT: Brief review of Soviet pre-war and post-war work, dealing only with the main trends in this complex field. Largely the author restricts himself to briefly outlining the subject matter and mentioning the names of the respective teams. No bibliography is given; however, the author states that a full bibliography is contained in his article "Turbulence" published in the symposium "Mechanics during the last thirty years" in 1950.

ASSOCIATION: Ac. Sc. USSR, Institute of Physics of the Atmosphere. (Akademiya Nauk SSSR Institut Fiziki Atmosfery)

AVAILABLE: Library of Congress.

Card 1/1

Name : OBUKHOV, A. M.

Title : Professor, Associate Member of USSR Academy of Sciences

Remarks : Professor Obukhov is the author of an article entitled "Exploration Outside the Atmosphere". The article mentions the role of the sputnik in measuring the thickness of the atmosphere, electricity in the ionosphere, and the distribution of clouds and earth currents around the globe.

Source : P: Wissen und Leben (Leipzig), No. 12, 1957, Special Appendix, "Der Erste Schritt in den Kosmos" (First Step into Space), p. 12

OBUKHOV, A. M.

"Description of Turbulence in the Terms of Lagrangian Variables."

papers submitted for Intl. Symposium on Atmospheric Diffusion and Air-Pollution (IUTAM) (IUGG) 24-29 Aug 58, Oxford, UK.

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001237720012-6"

OBUKHOV, A. M.

3(7) P. 2 PHASE I BOOK EXPLOITATION SOV/1837

Akademiya nauk SSSR. Institut fiziki atmosfery

Raboty po dinamicheskoy meteorologii (Works on Dynamic Meteorology) Moscow, Izd-vo AN SSSR, 1958. 186 p. (Series: Its: Trudy, vyp. 2) 1,500 copies printed.

Resp. Ed.: I.A. Kibel', Corresponding Member, USSR Academy of Sciences; Ed. of Publishing House: K.P. Gurov.

PURPOSE: The issue of the Institutes' Trudy [Transactions] is intended for scientists and research workers engaged in weather forecasting and climatology.

COVERAGE: This collection of articles represents the results of 12 studies in dynamic meteorology, carried out from 1951 through 1954. They treat weather forecasting techniques using the methods of dynamic meteorology as well as general theoretical questions in the study of climate. All authors,

Card 1/3

Name : OBUKHOV, Alexander M

Title : Associate Member of USSR Academy of Sciences

Remarks: Obukhov, in his article, "The World's Weather", points out how the man-made satellite will open up broader possibilities for the study of the upper reaches of the atmosphere, and of its lower regions where weather is made; this, in turn, will be of great value in long-range weather forecasts.

Source : R USSR (Soviet publication, Washington, D.C.), No.1(16), January 1958, pp. 11-12

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A005/A001

3.5000

Translation from: Referativnyy zhurnal, Mekhanika, 1960, No. 8, p. 94, # 10405

AUTHORS: Obukhov, A. M., Chaplygina, A. S.

TITLE: The Variation of the Baric Field in the Medial Troposphere

PERIODICAL: Tr. In-ta fiz. atmosf. AN SSSR, 1958, No. 2, pp. 23-49

TEXT: The work was performed in 1951-1952. The theoretical and empirical investigation of the variability of the baric field in the medial troposphere is described. The authors follow Ye. N. Blinova (1943), A. M. Obukhov (1949), and I. A. Kibel' (1950) and use the vorticity transfer equation (besides the heat supply equation) as the basic forecast equation. The solution of these equations is given in a form differing somewhat from that adopted in latter works. Thus the unknown functions $\partial p/\partial t$ and w (where p is the pressure, w is the vertical velocity) are replaced by:

$$\dot{H} = \frac{RT}{g}\frac{\partial \ln p}{\partial t}, \qquad w_1 = \frac{T(z)}{T} w .$$

This makes it possible to obtain linear differential equations for $\dot{H}$ and w_1 with

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The Variation of the Bario Field in the Medial Troposphere

practically constant coefficients, when $\zeta = \ln (p_0/p)$ is an independent variable Furthermore, replacing $\Delta \partial \ln p / \partial t$ by $-k^2 \partial \ln p / \partial t$ (where k is determined by the scale of isallobaric source regions), the problem is reduced to ordinary differential equations with the variable ζ (solution for one wave without allowance for dispersion). The solutions for H and w_1 are given in the form of integrals in ζ of the Green function multiplied by the vorticity advection and the temperature advection. Graphs of the Green functions are added (depending only on the altitude). The presented formulae cannot be used immediately for forecasting, but they yield some qualitative conclusions. These concern the estimation of the vertical spread of the influence regions, the ratio of the weights of the individual levels, the dependence of these weights on the disturbance scale and on the stratification, the dependence of the signs of H and w_1 on the distribution of the vorticity advection and the temperature advection, and others. A statistical estimation of the disturbance scale in the isallobaric field at various levels is given for choosing the coefficient k. The correlation coefficients and the regression equations between the variations of H and ΔH in time are presented (hereat the Laplace operator was determined by finite differences with 800 km spacing). In the following division, the authors expound

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the results of a statistical investigation of the connection between the actual variations in pressure and "affecting factors" indicated by the theory - the vorticity advection and the temperature advection at various levels. For determining these connections, the variations in pressure observed are correlated (in the diagnostic plan) with the magnitudes of vorticity and temperature transfer for the same period. The regression equations, the correlation coefficients, and other data are presented. Some qualitative conclusions are drawn. Thus it is noticed that the variation in pressure at the various levels is mostly connected with the vorticity advection at the 700 mb level and with the advection OT 500/1,000. The existence of a "compensation level" (at 700 mb altitude) is cleared up, where the influence of the thermal factor is minimized. The last division of the work deals with the specification of the graphic method proposed by N. I. Buleyev for forecasting the charts AT 700. First of all, it is statistically established that the second term of the forecast formula of N. I. Buleyev $\delta H_{700} = a(H, \Delta H)_{700} + b(T, \Delta T)_{700}$ has lower weight than the first term. The proposed specifications of the graphic method of N. I. Buleyev tend along 2 directions: a) the choice of the optimum method of averaging when

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plotting the quasistationary B field, and b) the forecast of the evolution of this field. It is proposed to average accordingly to points located at two concentric circles, whereat the weights for these two groups of points are chosen from the condition of least interdiurnal variations of B. For forecasting the evolution of B, a semiempiric formula is proposed, according to which these variations are caused, on the one hand, by the inertia of the variations of B for the preceding 24 hours, and on the other hand, by the tendency of B to the climatic norm. The weights of these two factors (the tendency of B for the preceding 24 hours and the deviations of B from the climatic norm) are determined in statistical way. A formula for forecasting B is presented. The entire method of plotting the next chart AT 700 according to the proposed specified graphic procedure is described. Comparative data on the successfulness of forecasts with and without the proposed specifications are presented.

S. I. Belousov

Translator's note: This is the full translation of the original Russian abstract.

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15(6)

AUTHOR: Obukhov, A. M., Corresponding Member, AS USSR SOV/30-58-11-20/48

TITLE: News in Brief (Kratkiye soobshcheniya) Symposium on the Research of Atmospheric Diffusion and Air Pollution (Simpozium po izucheniyu atmosfernoy diffuzii i zagryazneniy vozdukha)

PERIODICAL: Vestnik Akademii nauk SSSR, 1958, Nr 11, pp 86 - 87 (USSR)

ABSTRACT: The symposium was held in Oxford (England) from August 24, to 29. It was organized by the International Union of Theoretical and Applied Mechanics, and the International Union of Geodesy and Geophysics. 105 scientists (experts in the fields of aero-mechanics and meteorology) participated in the meeting. A total of 42 reports were given. The Soviet delegate A.S.Monin reported on the theory of turbulent diffusion. After the end of the symposium a number of scientific institutes were visited. The British scientists expressed their desire to increase scientific

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News in Brief. Symposium on the Research of Atmospheric Diffusion and Air Pollution

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contacts with the Soviet Union.

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SOV/ 49-58-11-9/18

AUTHORS: Monin, A. S. and Obukhov, A. M.

TITLE: **Small Amplitude Atmospheric Variations and Adaptation of Meteorological Fields** (Malyye kolebaniya atmosfery i adaptatsiya meteorologicheskikh poley)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, 1958, Nr 11, pp 1360-1373 (USSR)

ABSTRACT: The movements of the air masses can be classified as slow (synoptic) and fast (waves). The fast processes having a small amplitude possess a character of short waves. Therefore, in order to determine the static and geostrophic properties, a problem of short waves in the atmosphere should be solved. The fast movements originate when an equilibrium of static and geostrophic conditions are disturbed. The waves are produced which spread into the surrounding air masses causing them to adjust their meteorological fields. Therefore, in order to establish the general equilibrium of the air masses, these short waves of the fast motion should be determined (filtered off). In order to describe the short waves $\Delta \frac{\partial \psi}{\partial t} = -\ell \Delta \varphi$ is obtained. From the last three

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equations of (5) the final expressions (9) are derived in the form most suitable for further analysis when (10) are included together with the condition (11). The equations (9) are applied in the solutions (12), therefore, the parameters of geostrophic wind (13) can be included. The solutions of (9) will be stable only if (14) to (16) are satisfied. If the initial parameters (10) are not related to (14), then the solutions (9) can be shown as a sum of the stable condition, i.e. function ψ_s and the unstable condition given by (17). Therefore, this can be solved by means of the equation (19) and the matrix (20) when the equation (18) is introduced. The final solution can be shown as (21), (22) and (23). The invariant (23) represents the potential eddy (Refs 1 and 4). It should be noted that from the third and fifth equations of (9) the equation:

$$\frac{\partial}{\partial t}(p - c^2\rho) = -\beta\chi$$

is obtained which can be transformed into an invariant (24)

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when χ and z = 0 (according to (11)). Solutions (9) in which $J_1 \equiv J_2 \equiv 0$ are called waving solutions.
By an application of the formula (12) J_1 and J_2 can be expressed by ϕ_s forming (25) and (26). Then, the function ϕ_s can be solved from the derivation (27) and the invariant obtained is an internal form of the potential eddy. Excluding the expression $\rho = -\frac{1}{g} \frac{\partial p}{\partial z}$ from (27), the expression (28) can be obtained (Ref 4) where α^2 has the value of (29). Also from the invariant (27) the equation (30) for the function Ψ can be found (Ref 4). From the solution ϕ_s the term defining the waving solution can be separated, assuming that the expression of potential eddy (27) is equal to zero. Then, the coefficients of the Eq.(15) do not depend on x, y, t. These equations have partial solutions (31) shown as harmonic waves with amplitudes related to z. Substituting (31) into (15) the equations (32) for the amplitudes Φ (z) and X(z) are obtained. If the frequency is shown as (33), then

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Small Amplitude Atmospheric Variations and Adaptation of Meteorological Fields

the expression of Φ takes the form (34). This motion does not show a vertical waving (Refs.1 and 4). Therefore, another dimensional solution should be found. This can be done when the height of the atmosphere $H = \bar{p}^{*}/g\bar{\rho}^{*}$ is introduced into the functions Φ and X. Then, they will be described by the expressions (35), (36) and (38). The frequencies related to (35) satisfy the function (37), but for practical reasons the Eq.(36) can be transformed in order to obtain (39) and (40). Waves can also be found with frequencies (41) in case of $\varkappa \to \infty$, which is typical for the internal gravitational waves. Another kind of waves (42) when $\varkappa \to 1$ can be found in isothermic conditions of the atmosphere. This type of waves represent the acoustic waving. The frequencies can be calculated as (43) or (44) according to the type: acoustic or gravitational respectively. Generally, it can be stated that the short waves, which are produced in the atmosphere, can be divided into three main categories: bidimensional, internal acoustic

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and internal gravitational.
There are 8 references, 6 of which are Soviet, 1 English, 1 German.

ASSOCIATION: Akademiya Nauk SSSR, Institut fiziki atmosfery (Institute of Physics of the Atmosphere, Ac.Sc., USSR)

SUBMITTED: April 10, 1958

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SOV/20-122-1-15/44

3(7)

AUTHORS: Monin, A. S., Obukhov, A. M., Corresponding Member, Academy of Sciences, USSR

TITLE: The Main Types of the Motions of a Baroclinic Atmosphere in the Field of the Coriolis Power (Osnovnyye tipy dvizheniy baroklinnoy atmosfery v pole sily Koriolisa)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 122, Nr 1, pp 58-61 (USSR)

ABSTRACT: This paper gives a classification of the main types of the dynamic processes in the atmosphere (horizontal vortex motions, gravitation waves and acoustic waves) on the basis of the solution of the problem of the small vibrations of a baroclinic atmosphere for sufficiently general assumptions. In this way, the filtering activity of the quasistatic approximation may be explained. The authors first give the system of the equations for the dynamics of the atmosphere. The state of relative rest is chosen as the "main state" of the atmosphere. Some quantities for the characterization of the excited state of the atmosphere are then defined. Linearizing the equations of the atmosphere dynamics (i.e.

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by eliminating the square terms), a new system of equations is deduced. This system (like the initial system) is of the fifth order with respect to time, and it describes approximately the evolution of the perturbations. The boundary conditions for the coordinate z are then given. For the solution of the Cauchy (Koshi) problem, 5 initial conditions are necessary. The above-mentioned system of equations has a family of steady solutions which depends on one arbitrary function $\varphi_s(x,y,z)$ of the coordinates. These steady-state solutions are horizontal and have no divergences; the formulae of the geostrophic wind and the equations of statics may be applied to them. The above-mentioned system of equations has an invariant - a function which may be linearly expressed by the initial characteristics of the field. The order of the system and the number of the independent characteristics of the field may be diminished by 2. The wave solutions are scattered "without leaving a trace". (If the characteristics of the wave field in the initial instant of time are different from zero within a certain finite region, they will approach zero

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for $t \to \infty$). The initial field may be given as a sum of a steady component and of a wave component. The authors then assume that the initial characteristics of the field satisfy certain conditions (which are given in this paper) everywhere, with exception of a finite region. The various characteristics may be given independently. In the course of time, the disturbing wave is scattered and the characteristics of the field approach the steady-state type in any finite region. This is the adaption process of the fields in the atmosphere. For an isothermal atmosphere, the solution may be found as a superposition of the corresponding partial solutions of the corresponding differential equation. The waves of higher frequencies are called acoustic waves, the waves of lower frequencies - gravitation waves. The adaption of the atmosphere to the quasistatic state takes some minutes. There are 5 references, 4 of which are Soviet.

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OBUKHOV, A. M.

PHASE I BOOK EXPLOITATION SOV/4867

Soveshchaniye po issledovaniyu mertsaniya zvezd, Moscow, 1958

Trudy Soveshchaniya po issledovaniyu mertsaniya zvezd, Moskva, 18-20 iyunya 1958 g. (Conference on the Study of Star Scintillation) Moscow, Izd-vo AN SSSR, 1959. Errata slip inserted. 1,000 copies printed.

Editorial Board: A. M. Obukhov, Corresponding Member, Academy of Sciences USSR; Resp. Ed.: O. A. Mel'nikov, Professor; I. G. Kolchinskiy, Candidate of Physical and Mathematical Sciences; N. I. Kucherov, Candidate of Physical and Mathematical Sciences; Secretaries of the Editorial Board: N. V. Bystrova, Candidate of Physical and Mathematical Sciences; M. A. Kallistratova and L. N. Zhukova; Tech. Ed.: M. E. Zendel'.

PURPOSE: This book is intended for astronomers. It may be of interest to physicists studying the atmosphere and designers of astronomical equipment.

COVERAGE: The book reports on the Transactions of the Conference on the Study of Stellar Scintillation, held in Moscow from 18 to 23 June 1958. The Conference was organized by the Astronomical Council AS USSR and the Institute of Physics of the Atmosphere AS USSR. The book contains summaries of 23 reports read at the

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[Institute of Physics of the Atmosphere AS USSR]. Theoretical Research on the Problem of Stellar Scintillation 5

Tatarskiy, V. I. [Institute of Physics of the Atmosphere AS USSR]. Interpreting the Observations of the Scintillation of Stars 7

Bovsheverov, V. M., A. S. Gurvich, V. I. Tatarskiy, and L. R. Tsvang [Institute of Physics of the Atmosphere AS USSR]. Instruments for the

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Obukhov, M. A. 61

Mel'nikov, O. A. 61

MORNING SESSION, June 19th

Reports:

Mel'nikov, O. A., I. G. Kolchinskiy, and N. I. Kucherov. Scintillation and Flickering of Star Images. Astroclimate. (Review of Scientific Works) 63

Zhukova, L. N. [Glavnaya astronomicheskaya observatoriya AN SSSR - Main Astronomical Observatory AS USSR]. Observations of Stellar Scintillation Made at Pulkovo With the ASI-5 Telescope 115

Demidova, A. N. [Main Astronomical Observatory AS USSR]. Observations of Stellar Scintillation Made at Pulkovo With the AZT-7 Telescope 123

OBUKHOV, A. M.

"The Influence of Buoyancy on the Fine Structure of Turbulence,"

report presented at the Intl. Symposium on Fluid Mechanics in the Ionosphere, Ithaca, New York, 9-15 Jul 1959.

Inst. Physics of the Atmosphere, [redacted] Moscow

3.5150
3.5140

S/035/61/000/009/017/036
A001/A101

AUTHOR: Obukhov, A. M.

TITLE: On theoretical studies of the stellar scintillation problem

PERIODICAL: Referativnyy zhurnal. Astronomiya i Geodeziya, no. 9, 1961, 32, abstract 9A248 ("Tr. Soveshchaniya po issled. mertsaniya zvezd", 1958. Moscow-Leningrad, AN SSSR, 1959, 5-7. Discuss., 60-62)

TEXT: The author analyzes the state of the problem of theoretical studies of star scintillations. He notes that considerable successes have been achieved, in particular, in studying the dependence of brightness fluctuations and tremor amplitude on the zenith distance of the star and characteristics of atmospheric turbulence, in calculating the temporary spectrum of fluctuation of brightness and incidence angle, as well as in estimating the influence of the optical system on results of measuring various characteristics of star scintillation phenomenon observed with telescopes. The author briefly reviews the works by J. van Isacker, L. A. Chernov, V. I. Tatarskiy and others on the theory of star scintillation.

L. Zhukova, I. Aslanov

[Abstracter's note: Complete translation]

VB

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24(8), 10(7) SOV/20-125-6-19/61

AUTHOR: Obukhov, A.M., Corresponding Member, ~~AS USSR~~

TITLE: On the Influence Exercised by the Archimedean Forces on the Structure of the Temperature Field in a Turbulent Flow (O vliyanii arkhimedovykh sil na strukturu temperaturnogo polya v turbulentnom potoke)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 125, Nr 6, pp 1246-1248 (USSR)

ABSTRACT: In 3 earlier papers dealing with the theoretical analysis of the problem of the microstructure of the temperature field in a turbulent flow the temperature pulsations are assumed to be so small that the influence exercised by Archimedean forces upon the dynamics of the flow may be neglected. With other words, the heat transferred by the turbulent flow is considered to be a passive admixture. The present paper deals with the determination of the limits of applicability of this hypothesis on the basis of the qualitative investigation of the influence of Archimedean forces by the methods of the theory of the number of dimensions. The pulsations $T_1 = T - T_0$ are assumed

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to be small as against a certain average temperature T_0 of the medium, but the Archimedean forces are nevertheless taken into account. The condition $|T_1|/T_0 \ll$ is satisfied with sufficient accuracy for the layer located near the surface of the earth and makes it possible to describe the motion of a medium that is inhomogeneous with respect to temperature by using the approximation equations of the convection theory

$$\frac{du}{dt} = -\frac{1}{\rho_0}\frac{\partial p_1}{\partial x} + \nu\Delta u, \quad \frac{dv}{dt} = -\frac{1}{\rho_0}\frac{\partial p_1}{\partial y} + \nu\Delta v, \quad \frac{dw}{dt} = -\frac{1}{\rho_0}\frac{\partial p_1}{\partial z} + \nu\Delta w + \beta T_1,$$

$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = 0, \quad \frac{dT_1}{dt} = \chi\Delta T_1$. Here u,v,w denote the velocity components of the flow; p_1 - the deviation of pressure from the standard; $T_1 = T - T_0$ - the deviation of temperature from normal; ρ_0 - the standard value of medium density; ν and χ - the kinematic viscosity and the temperature conductivity of the

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medium; $\beta = g/T_0$ denotes the "buoyancy parameter", which enters as a factor into the expression for the Archimedean force. The turbulence developing under the action of the Archimedean forces cannot be considered to be locally isotropic in the usual sense. The author therefore investigates, as the fundamental statistical characteristic of the temperature-pulsation field, the structural function $H(r;z) = \overline{\left[T(M')-T(M)\right]^2}$ in the horizontal plane. The author confined his activities to investigating the structural function $H(r;z)$ for an arbitrarily fixed value of z within the range of the "average dimensions" $l_1 \ll r \ll z$, where $l_1 \sim \sqrt[4]{\kappa^3/\varepsilon}$ denotes the internal dimensions of the turbulence (in the atmosphere of the order of magnitude of 1 cm). In turbulent disturbances of medium dimensions the direct influence exercised by viscosity and thermal conductivity may be neglected, and the only dimension parameter of the system initially written down is the parameter β. If the local structure of the temperature field is looked upon as external parameters (determining the statistical

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behavior of the pulsations), it is advisable to assume a dissipation of the energy ε and a "temperature dissipation" N. It holds that $N = \chi(\mathrm{grad}T)^2$. In the case of sufficiently small distances, the influence exercised by the Archimedean forces is insignificant. In conclusion there follows an estimation of the minimum extent of the inhomogeneities above which the influence exercised by the Archimedean forces begins to be of importance. The estimation is carried out on the assumption of real conditions in the atmospheric layer near the surface of the earth. There are 10 references, 8 of which are Soviet.

ASSOCIATION: Institut fiziki atmosfery Akademii nauk SSSR (Institute for the Physics of the Atmosphere of the Academy of Sciences)

SUBMITTED: February 16, 1959

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OBUKHOV, A. M. (Moscow)

"On the Microstructure of Temperature-and Velocity Fields in Free-Convection Flows."

report presented at the First All-Union Congress on Theoretical and Applied Mechanics, Moscow, 27 Jan - 3 Feb 1960.

MONIN, A.S.; OBUKHOV, A.M.

Principal types of motions of a baroclinic atmosphere in the field of the Coriolis force; abstract. Nek.probl.meteor. no.1:27 '60. (MIRA 13:8)

(Atmosphere)

S/049/60/000/03/008/019
E131/E691

AUTHOR: Obukhov, A.M.

TITLE: Statistically Orthogonal Expansion of Empirical Functions

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya geofizicheskaya, 1960, Nr 3, pp 432-439 (USSR)

ABSTRACT: A method of statistical analysis of empirical functions, based on "natural" orthogonal expansions, is given. The method is illustrated on theoretical examples and on daily variations of the barometric pressure field, as a function of the height above the earth. In many cases a two-parameter model is found to be sufficient to describe pressure variations in a real atmosphere. There are 1 figure, 2 tables and 7 Soviet references.

ASSOCIATION: Akademiya nauk SSSR, institut fiziki atmosfery (Academy of Sciences USSR, Institute of Physics of the Atmosphere)

SUBMITTED: August 21, 1959

Card 1/1

AVSYUK, G.A.; BOGOMOLOV, G.V.; DOLGUSHIN, L.D.; ZENKOVICH, V.P.; MESHCHERYAKOV, Yu.A.; OBUKHOV, A.M.

Problems of physical geography at the 12th General Assembly of the International Union of Geodesy and Geophysics. Izv. AN SSSR. Ser. geog. no.6:126-130 N-D '60. (MIRA 13:10)
(Physical geography)

OBUKHOV, A.M.

Structure of the temperature and velocity field under conditions of free convection. Izv.AN SSSR.Ser.geofiz. no.9:1392-1396 S '60. (MIRA 13:9)

1. Akademiya nauk SSSR, Institut fiziki atmosfery.
(Atmospheric temperature)

OBUKHOV, A. M.

"Some Specific Features of Atmospheric Turbulence."

Presented at the International Symposium on Fundamental Problems in Turbulence and Their Relation to Geophysics, Marseille, France, Sept. 4-9, 1961

OBUKHOV, Aleksandr Mikhaylovich

Prognoses of forecasts. Nauka i zhizn' 29 no.7:77-78 Jl '62. (MIRA 16:6)

1. Direktor Instituta fiziki atmosfery AN SSSR. Chlen-korrespondent AN SSSR.

(Weather forecasting)

OBUKHOV, A.M. (Leningrad)

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OBUKHOV, A.M.

Dynamics of a stratified fluid. Dokl.AN SSSR 145 no.6:1239-1242 Ag '62. (MIRA 15:8)

1. Institut fiziki atmosfery AN SSSR. Chlen-korrespondent AN SSSR.

(Hydrodynamics)

OBUKHOV, A.M.

Adiabatic invariants of atmospheric processes. Meteor.i gidrol. no. 2:3-9 F '64. (MIRA 17:5)

1. Chlen-korrespondent AN SSSR. Institut fiziki atmosfery AN SSSR.

KUCHEROV, N.I., kand. fiz.-mat. nauk, otv.red.[deceased]; MEL'NIKOV, O.A., red.; OBUKHOV, A.M., red.; DEMIDOVA, A.N., red.; KOLCHINSKIY, I.G., red.; TATARSKIY, V.I., red.

[Optical instability of the earth's atmosphere] Opticheskaia nestabil'nost' zemnoi atmosfery. Moskva, Nauka, 1965. 170 p. (MIRA 18:7)

1. Akademiya nauk SSSR. Astronomicheskiy sovet. 2. Chlen-korrespondent AN SSSR (for Mel'nikov, Obukhov).

OBUKHOV, A.M.

Statistical description of the meteorological fields on a planetary scale. Meteor. issl. no.9:180-181 '65.

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OBUKHOVA, G.G.

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Study of the dynamics of large-scale atmospheric processes. Vest. AN SSSR 35 no.10:99-1[illegible] O '65. (MIRA 18:10)

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OBUKHOV, A.N., uchitel'

New method of making mirrors. Khim.v shkole 15 no.1:84-85 Ja-F '60. (MIRA 13:5)

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(BOTANY, MEDICAL)

The mutual replacement reaction of phenylacetic and salicylic acids from compounds with β-naphthylamine. A. P. Ocuzmov. *J. Russ. Phys.-Chem. Soc* **62**, 1919-31(1930).—In the binary system $PhCH_2CO_2H$ (I) o-$C_6H_4(OH)CO_2H$ (II) there is a simple eutectic at 65° corresponding to the compn. 85% I and 15% II. The binary system I β-$C_{10}H_7NH_2$ (III) gives a chem. compd. (IV), m. 71.5° (decompn.), with a transition pt. corresponding to 50% I. The eutectic between I and IV lies at 44.2° and corresponds to the compn. 34.7% (by wt.) of III. To obtain the true temps. of crystn., the introduction of crystals of the corresponding phase is necessary. In the system I-III there was observed a metastable condition in which a chem. compd. is not formed and eutectics are observed below the stable eutectic, at 28.32°. A picture of the distribution of III between I and II is obtained by studying the included triangular diagrams. The triangular diagram shows 5 fields with 2 ternary transition pts. and one ternary eutectic pt. Of the 2 compds. shown, the more sharply defined is that of II with III. Lewis W. Riev

ASA-SLA METALLURGICAL LITERATURE CLASSIFICATION

CA

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Precipitation of magnesium chloride from hydrochloric acid solutions. A. P. Obukhov and V. P. Lavrov. *J. Applied Chem.* (U. S. S. R.) 4, 994-1001(1931).—The system $MgCl_2$-H_2O-HCl was investigated at 0°, 25°, 50°, 82° and 100°. V. K.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

CA

18

Absorption of hydrochloric acid by solutions of magnesium chloride. A. P. ONLE-
NOV AND M. N. MIKHAILOV. *Kalii* (U. S. S. R.) 3, 20-23(1932). Plant expts. on
production of HCl and MgO by action of superheated steam on $MgCl_2$ were made.
It is proposed to use $MgCl_2$ soln. for absorption of the gaseous products of $MgCl_2$ hy-
drolysis. The system $MgCl_2$-H_2O-HCl was studied within the temp. range 10-100°.
The soly. of HCl in $MgCl_2$ solns. decreased sharply with temp. rise. Instant absorption
of HCl gases was observed, with pptn. of solid $MgCl_2.H_2O$. Addn. of $MgCl_2$ to weak
solns. of HCl increases the amt. of HCl in the gas phase and decreases H_2O vapor.

JAMES SORREL

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

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3RD AND 4TH ORDERS

8C

A.P. Obuchov

Double decomposition in the absence of a solvent. XIX. A. P. Obukhov. **XX, XXI.** V. P. Radishchev [illegible] (J. Gen. Chem. Russ., 1933, 3, 787–791, 843–851, [illegible]).—XIX. Fusion diagrams are given for the system $NaI + KBr \longrightarrow NaBr + KI$.

XX. The diagrams for NaCl–NaBr–NaI and KCl–KBr–KI suggest the formation of solid solutions which contain all three components.

XXI. Diagrams are given for the system $2NaCl + K_2CO_3 \longrightarrow 2KCl + Na_2CO_3$. R. T.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

Bi

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[illegible] [illegible] [illegible] [illegible] dry air has been passed [illegible] and two (I) containing H_2O; HCl is determined by titration in the first, fourth, and fifth (I) and H_2O gravimetrically in the first, second, and third (I). R. T.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION